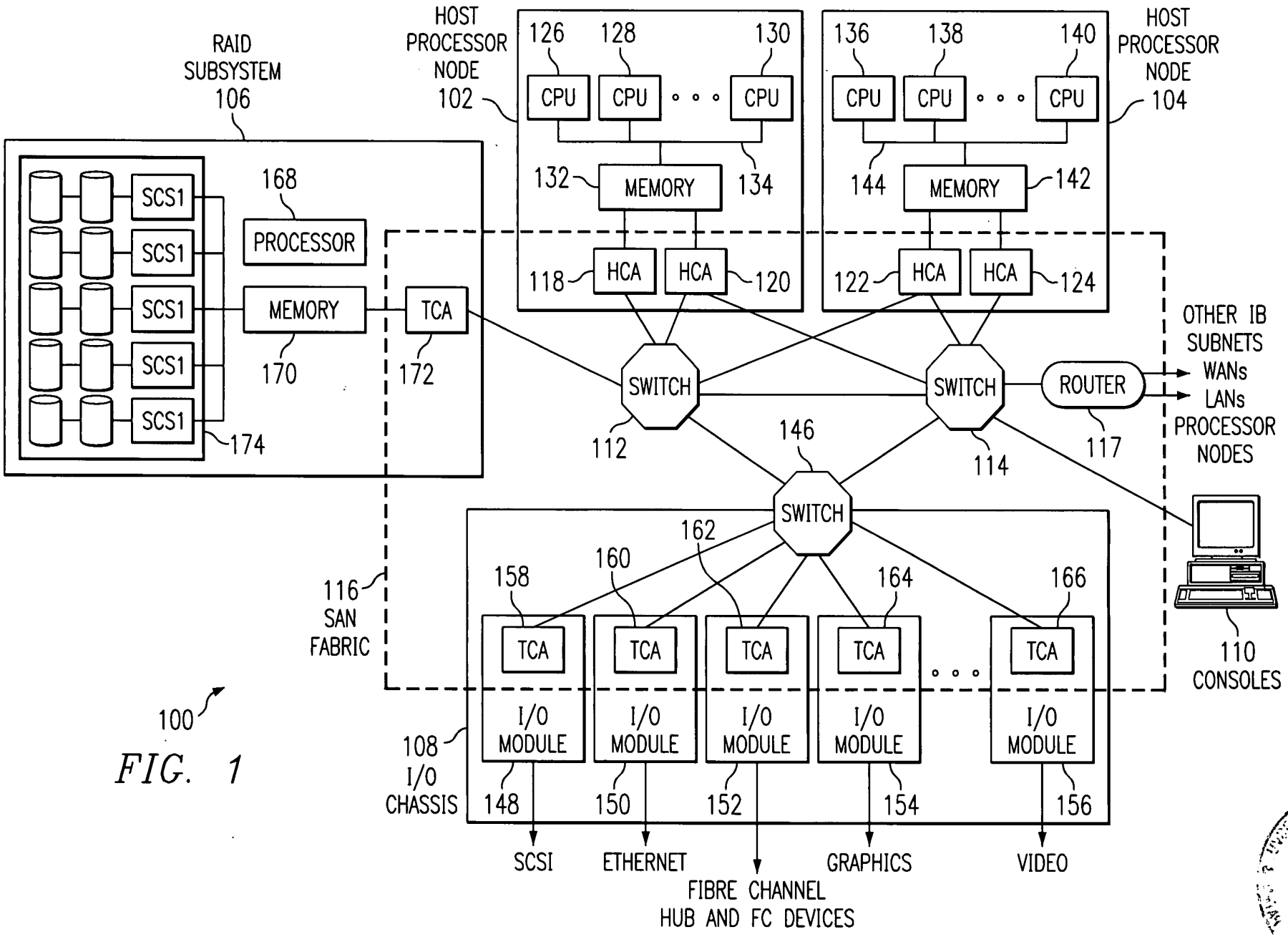

RAID SUBSYSTEM 106
HOST PROCESSOR NODE 102
HOST PROCESSOR NODE 104
126
128
130
136
138
140
CPU
MEMORY
132
134
144
142
118
120
122
124
HCA
168
PROCESSOR
170
172
TCA
SCS1
174
SWITCH
112
114
146
117
ROUTER
OTHER IB SUBNETS
WANs
LANs
PROCESSOR NODES
110
CONSOLES
116
SAN FABRIC
158
160
162
164
166
I/O MODULE
108
I/O CHASSIS
148
150
152
154
156
SCSI
ETHERNET
GRAPHICS
VIDEO
FIBRE CHANNEL HUB AND FC DEVICES
100

FIG. 1

TOSTOT: 56552660

FIG. 2

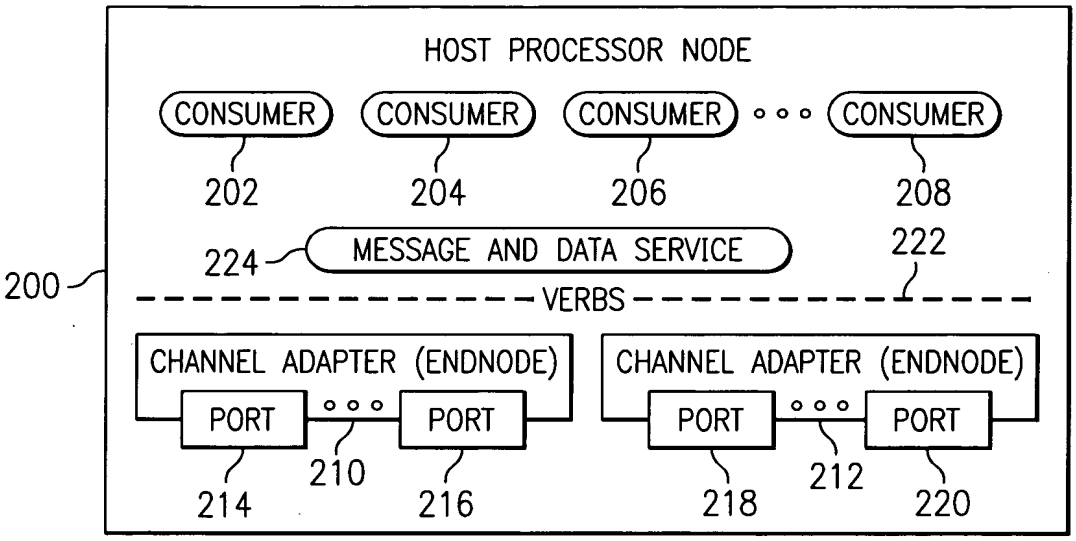


FIG. 3A

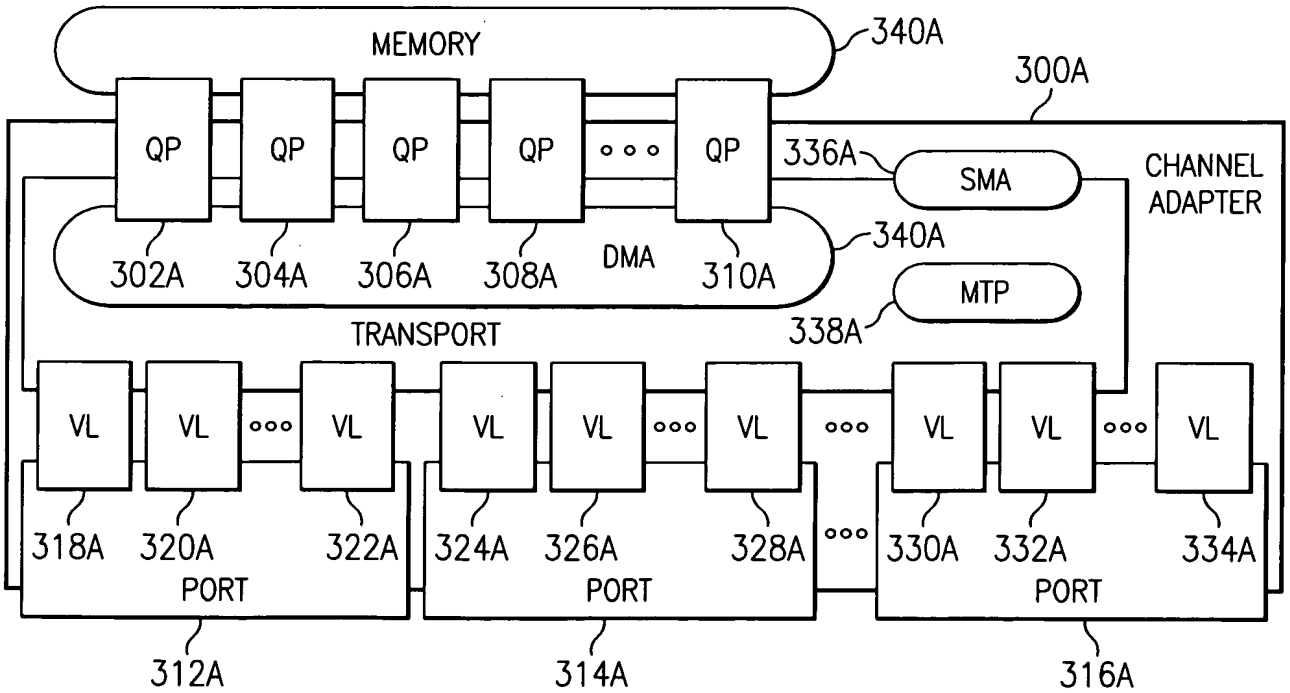


FIG. 3B

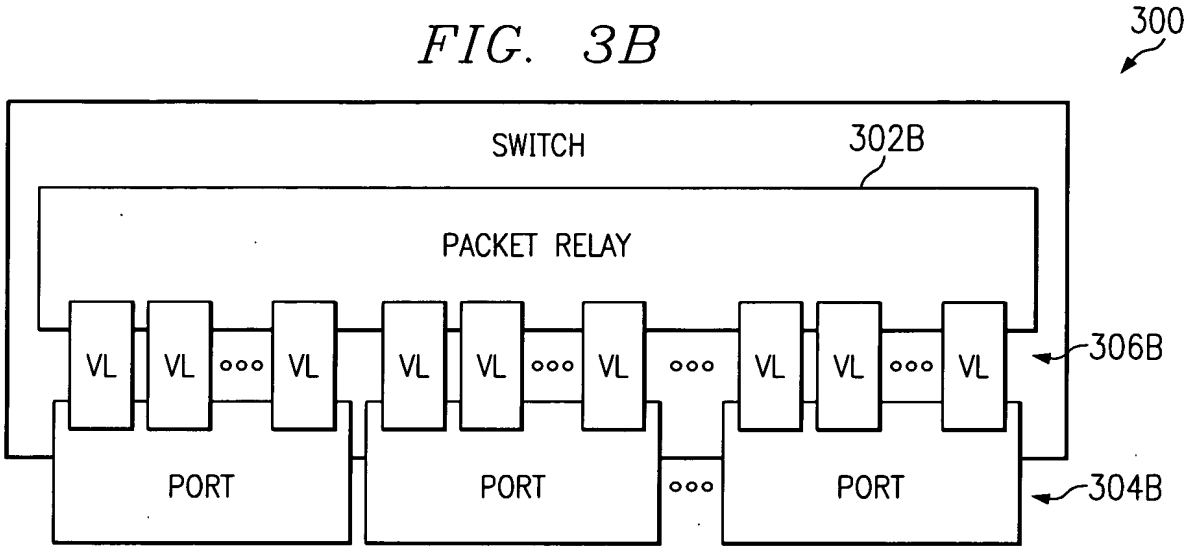
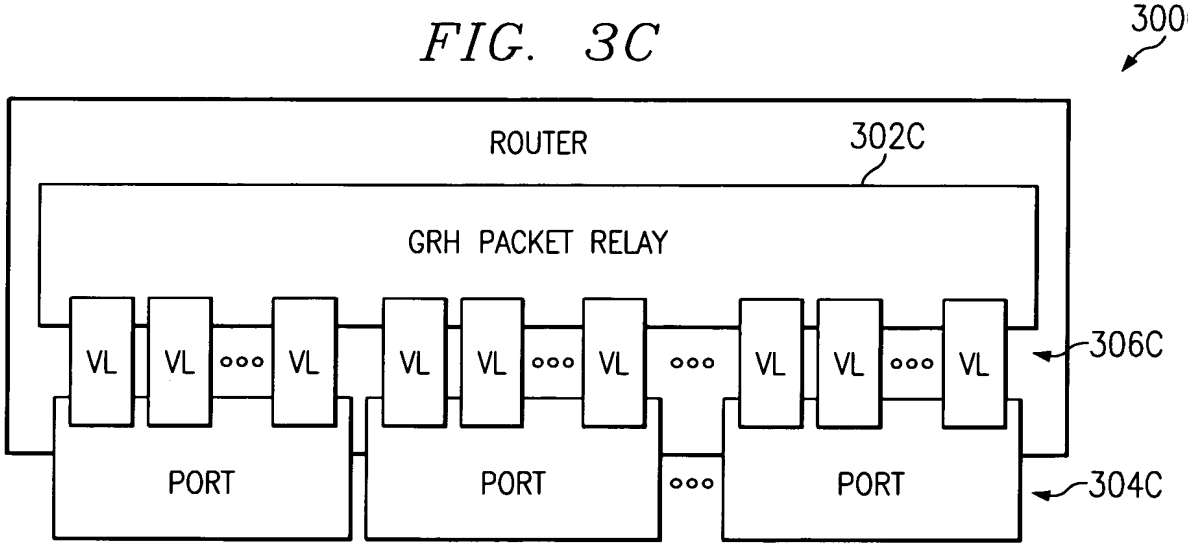

300B
SWITCH
302B
PACKET RELAY
VL
VL
VL
VL
VL
VL
VL
VL
VL
VL
306B
PORT
PORT
PORT
304B

FIG. 3C


300C
ROUTER
302C
GRH PACKET RELAY
VL
VL
VL
VL
VL
VL
VL
VL
VL
VL
306C
PORT
PORT
PORT
304C

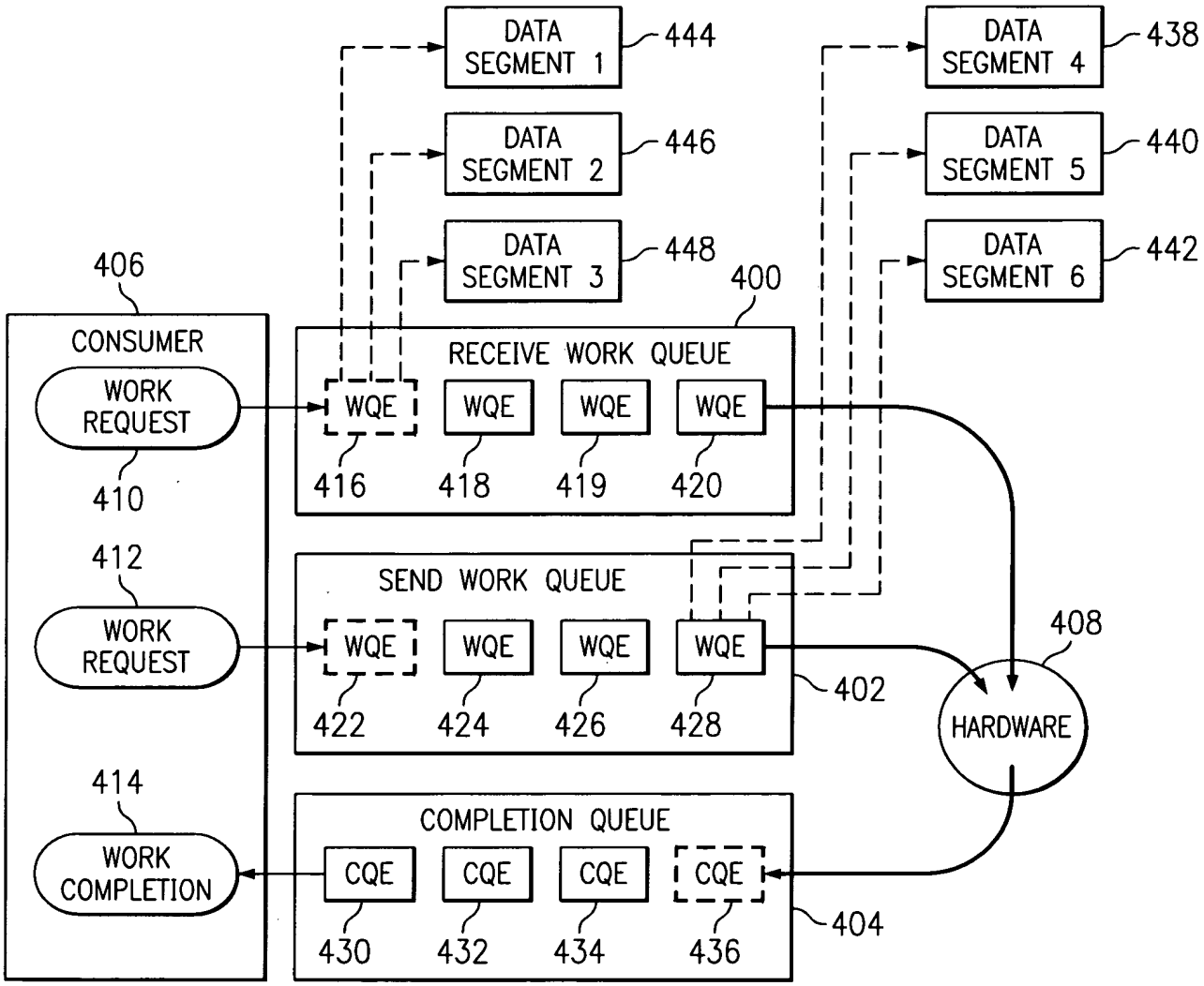

DATA SEGMENT 1
444
DATA SEGMENT 2
446
DATA SEGMENT 3
448
DATA SEGMENT 4
438
DATA SEGMENT 5
440
DATA SEGMENT 6
442
406
CONSUMER
WORK REQUEST
410
412
WORK REQUEST
414
WORK COMPLETION
400
RECEIVE WORK QUEUE
WQE
WQE
WQE
WQE
416
418
419
420
SEND WORK QUEUE
WQE
WQE
WQE
WQE
422
424
426
428
402
408
HARDWARE
COMPLETION QUEUE
CQE
CQE
CQE
CQE
430
432
434
436
404

FIG. 4

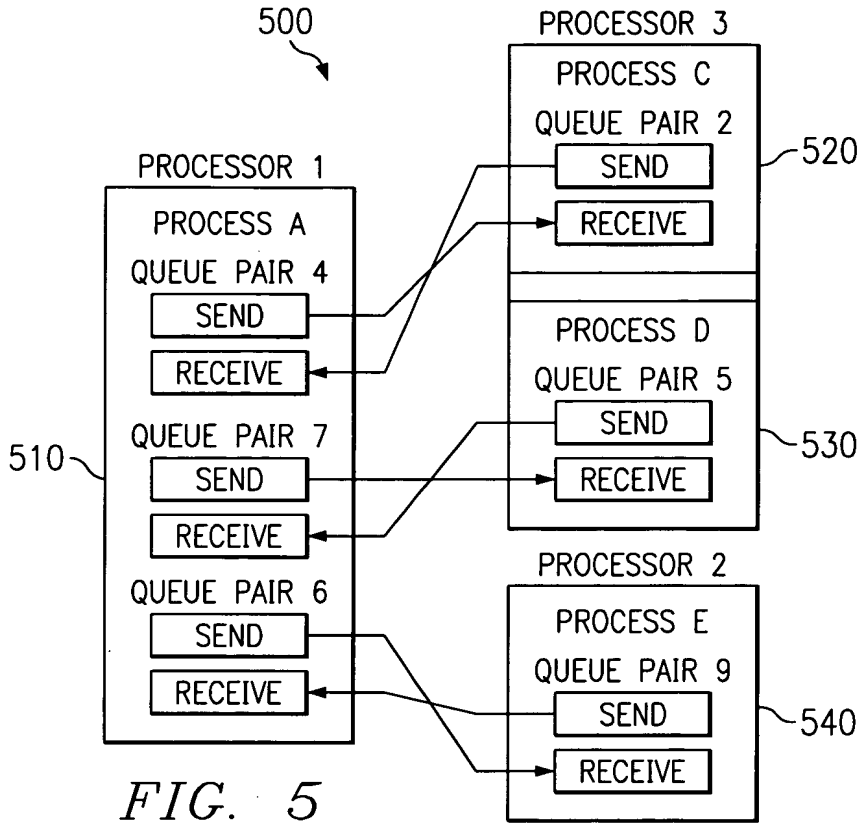

500
PROCESSOR 1
PROCESS A
QUEUE PAIR 4
SEND
RECEIVE
QUEUE PAIR 7
SEND
RECEIVE
QUEUE PAIR 6
SEND
RECEIVE
510
PROCESSOR 3
PROCESS C
QUEUE PAIR 2
SEND
RECEIVE
520
PROCESS D
QUEUE PAIR 5
SEND
RECEIVE
530
PROCESSOR 2
PROCESS E
QUEUE PAIR 9
SEND
RECEIVE
540

FIG. 5

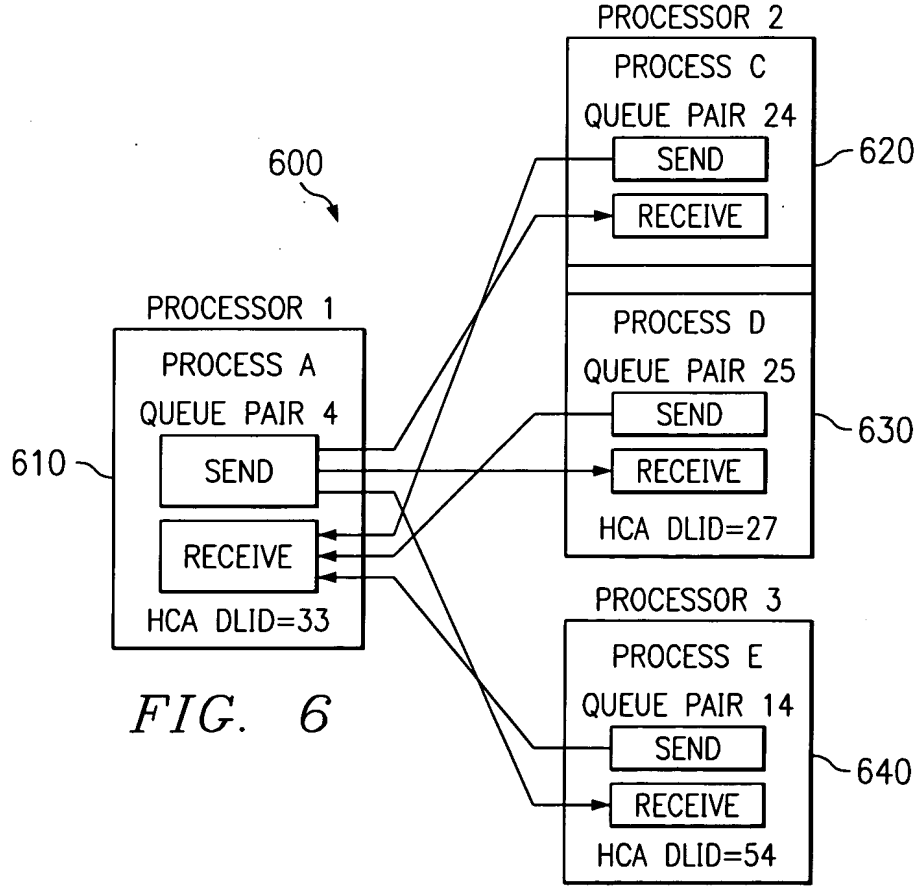

600
PROCESSOR 2
PROCESS C
QUEUE PAIR 24
SEND
RECEIVE
620
PROCESSOR 1
PROCESS A
QUEUE PAIR 4
SEND
RECEIVE
HCA DLID=33
610
PROCESS D
QUEUE PAIR 25
SEND
RECEIVE
HCA DLID=27
630
PROCESSOR 3
PROCESS E
QUEUE PAIR 14
SEND
RECEIVE
HCA DLID=54
640

FIG. 6

FIG. 7

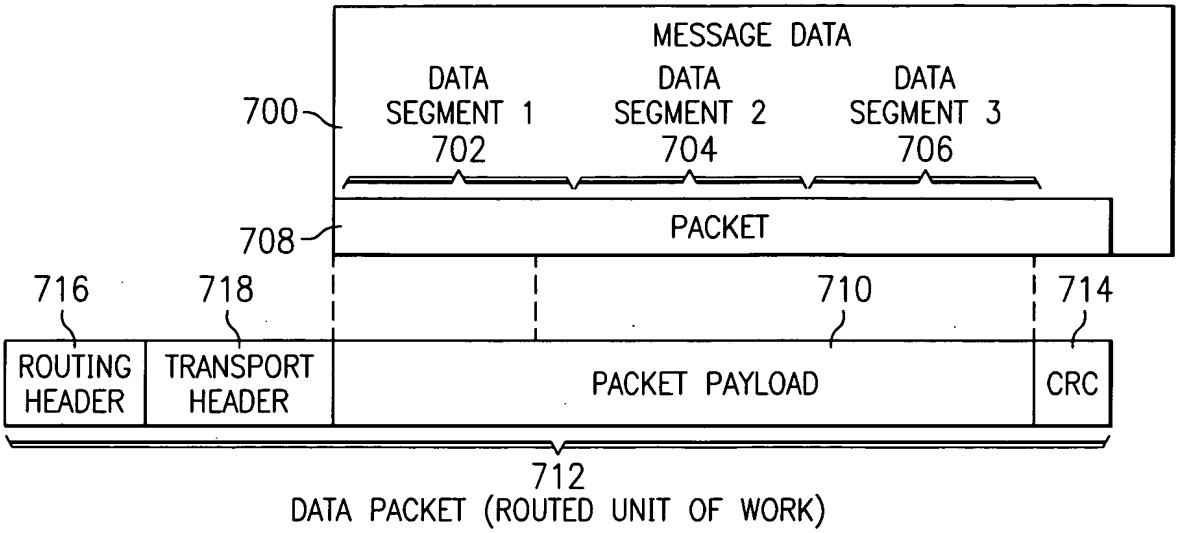

MESSAGE DATA
DATA SEGMENT 1
702
DATA SEGMENT 2
704
DATA SEGMENT 3
706
700
PACKET
708
716
718
710
714
ROUTING HEADER
TRANSPORT HEADER
PACKET PAYLOAD
CRC
712
DATA PACKET (ROUTED UNIT OF WORK)

FIG. 8

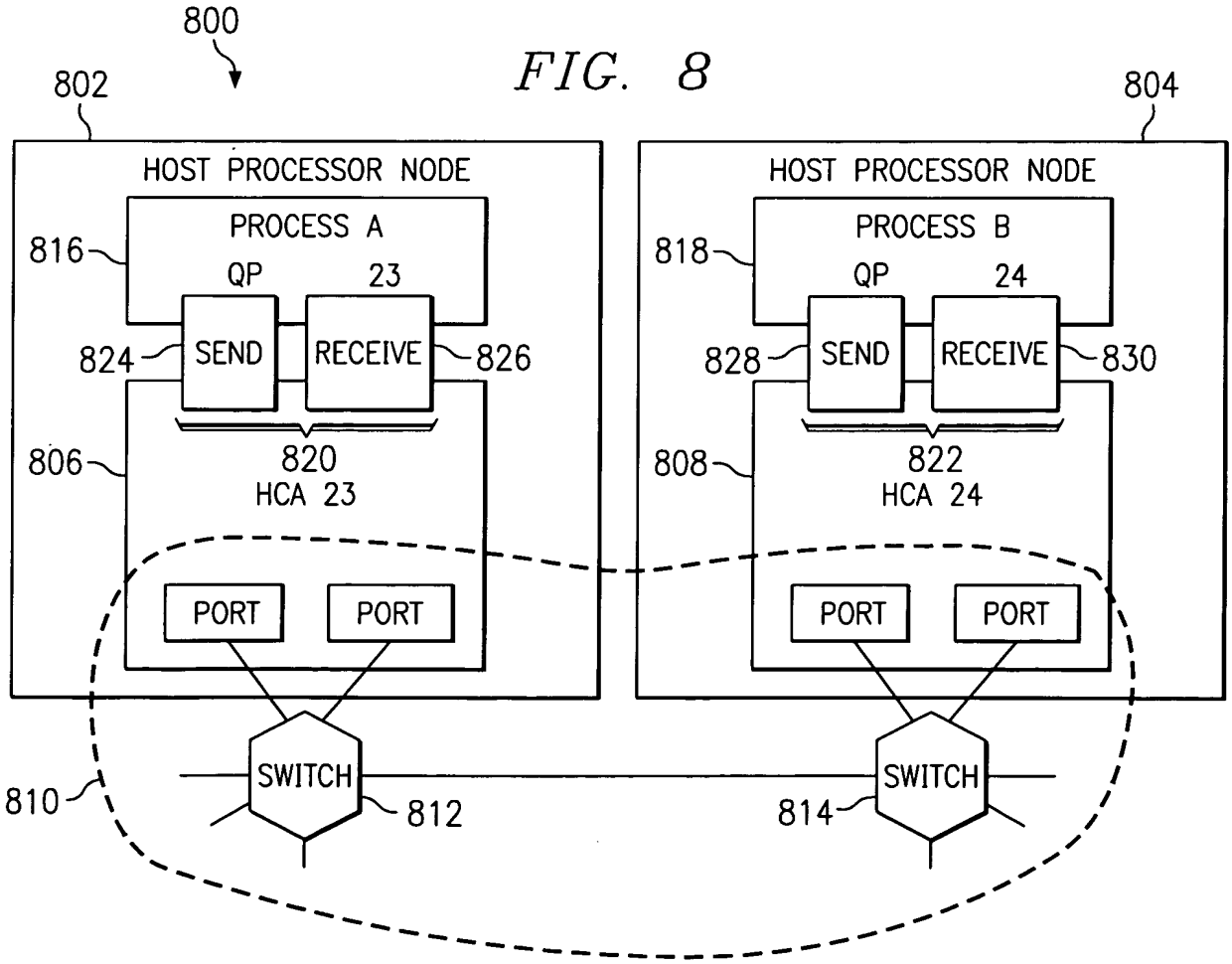

800
802
804
HOST PROCESSOR NODE
HOST PROCESSOR NODE
PROCESS A
816
QP 23
PROCESS B
818
QP 24
SEND
RECEIVE
824
826
SEND
RECEIVE
828
830
806
820
HCA 23
808
822
HCA 24
PORT
PORT
PORT
PORT
SWITCH
SWITCH
810
812
814

FIG. 16

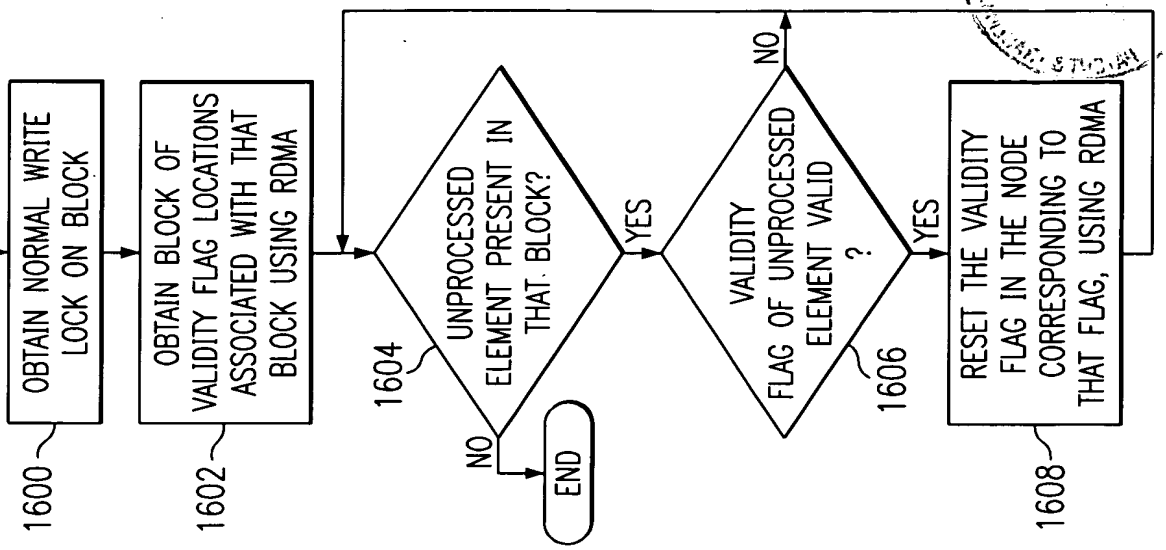
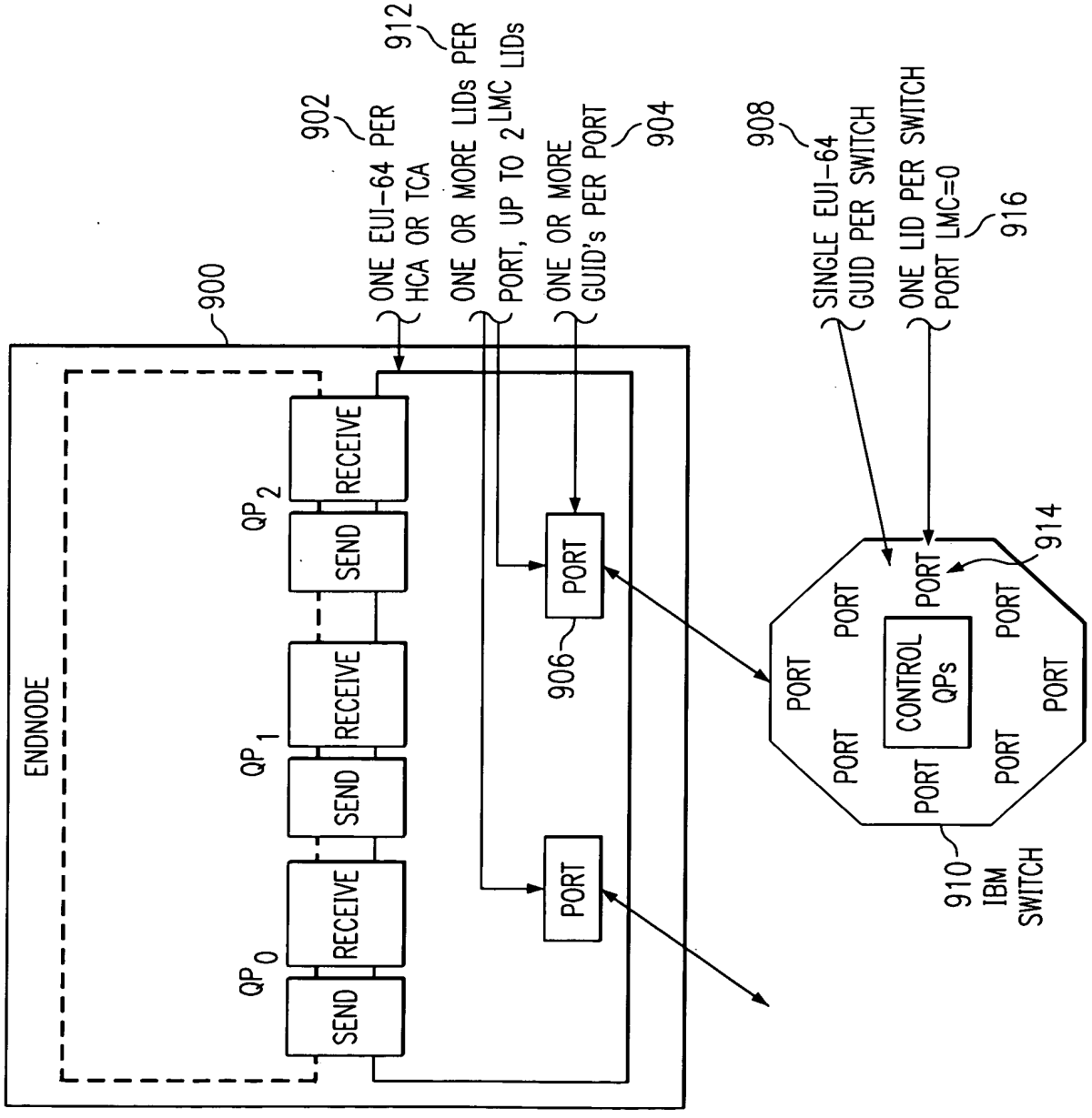

START
OBTAIN NORMAL WRITE LOCK ON BLOCK
1600
OBTAIN BLOCK OF VALIDITY FLAG LOCATIONS ASSOCIATED WITH THAT BLOCK USING RDMA
1602
UNPROCESSED ELEMENT PRESENT IN THAT BLOCK?
1604
NO
END
YES
VALIDITY FLAG OF UNPROCESSED ELEMENT VALID ?
1606
NO
YES
RESET THE VALIDITY FLAG IN THE NODE CORRESPONDING TO THAT FLAG, USING RDMA
1608

FIG. 9


900
ENDNODE
QP0
SEND
RECEIVE
QP1
SEND
RECEIVE
QP2
SEND
RECEIVE
902
ONE EUI-64 PER HCA OR TCA
912
ONE OR MORE LIDs PER PORT, UP TO 2LMC LIDs
904
ONE OR MORE GUID's PER PORT
906
PORT
PORT
908
SINGLE EUI-64 GUID PER SWITCH
ONE LID PER SWITCH PORT LMC=0
916
914
PORT
PORT
PORT
PORT
CONTROL QPs
PORT
PORT
PORT
PORT
910
IBM SWITCH

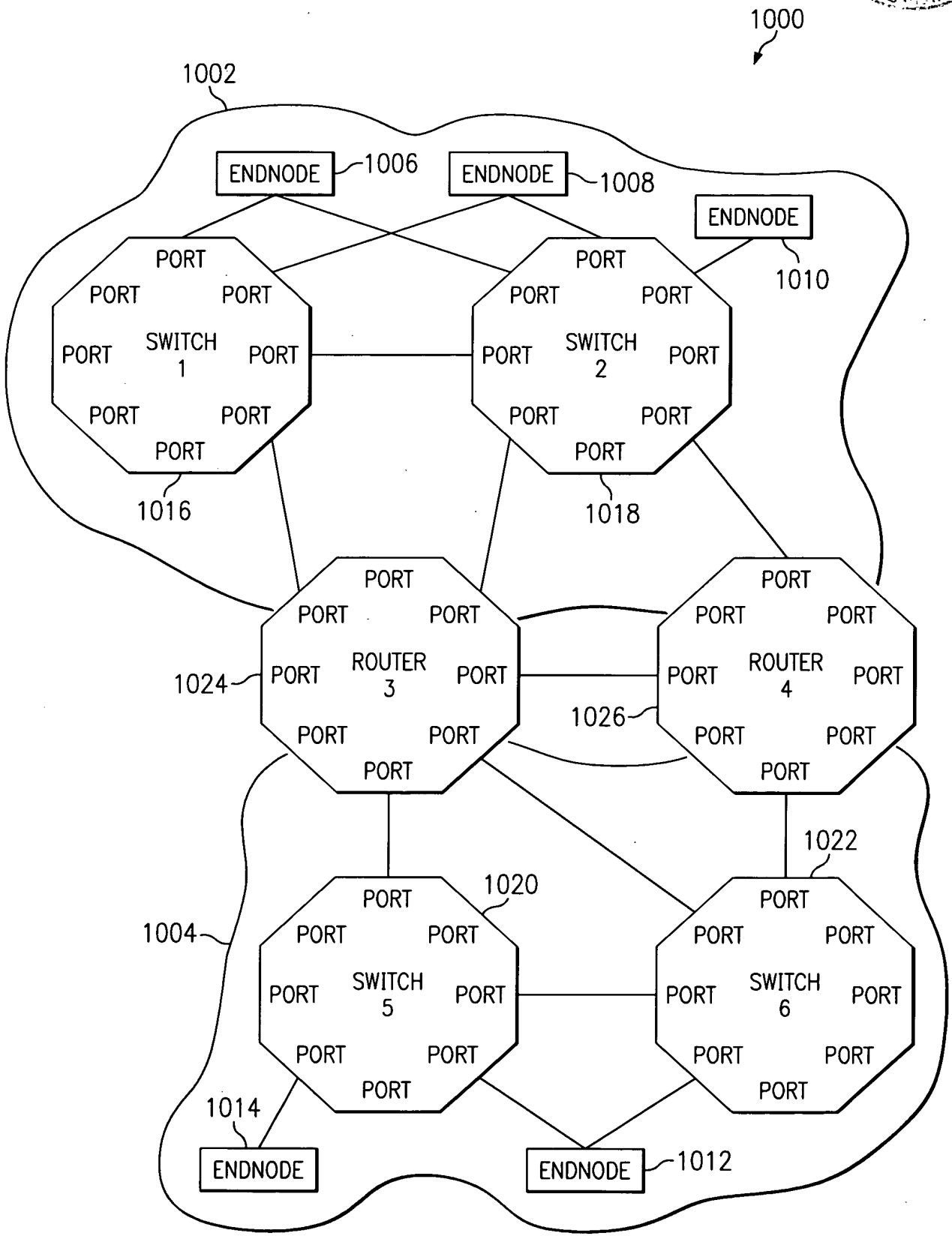

1000
1002
ENDNODE
1006
ENDNODE
1008
ENDNODE
1010
PORT
SWITCH 1
SWITCH 2
1016
1018
ROUTER 3
ROUTER 4
1024
1026
1022
1020
1004
SWITCH 5
SWITCH 6
1014
1012

FIG. 10

FIG. 11

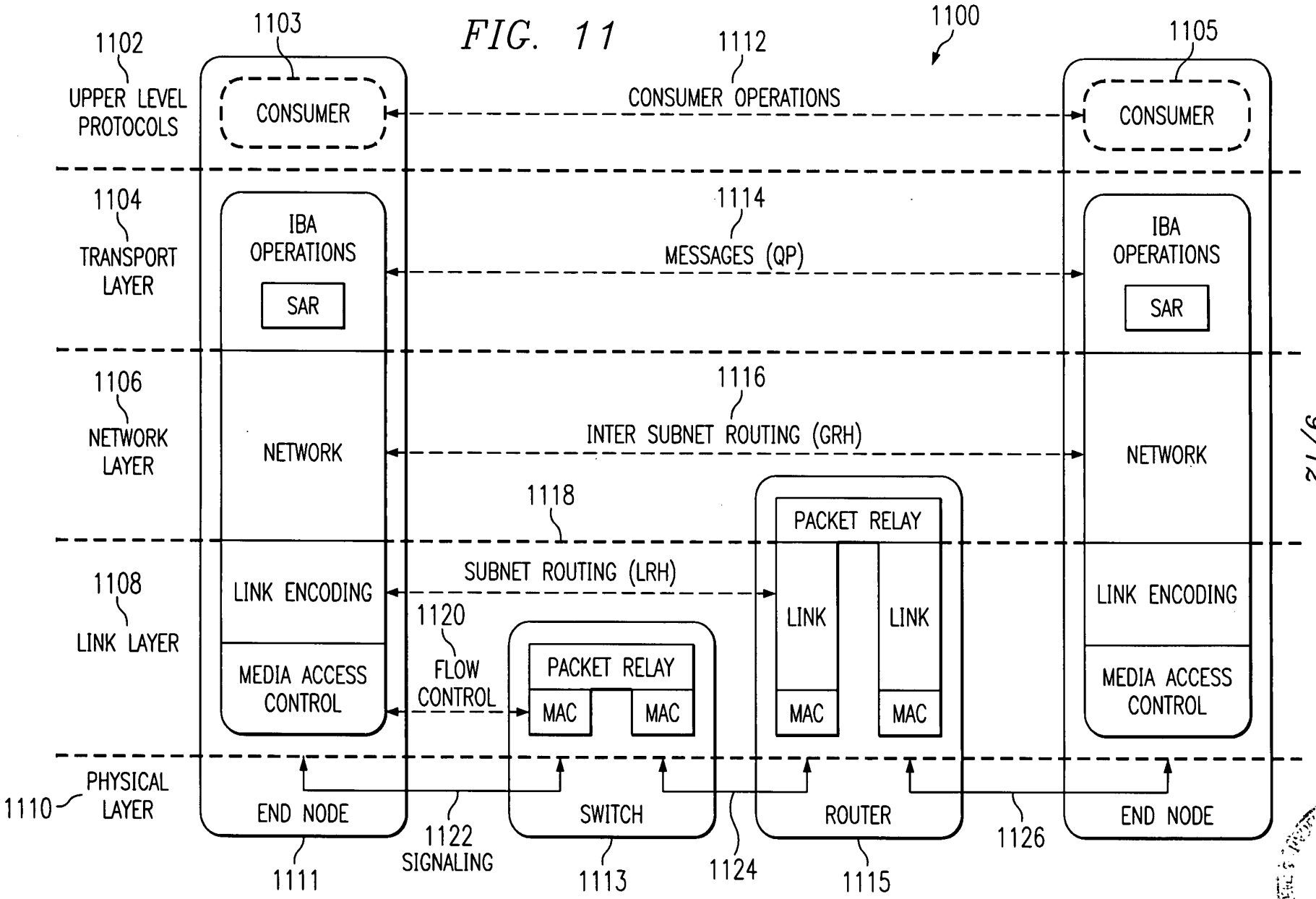

1100
1102
UPPER LEVEL PROTOCOLS
1103
CONSUMER
1112
CONSUMER OPERATIONS
1105
CONSUMER
1104
TRANSPORT LAYER
IBA OPERATIONS
SAR
1114
MESSAGES (QP)
IBA OPERATIONS
SAR
1106
NETWORK LAYER
NETWORK
1116
INTER SUBNET ROUTING (GRH)
NETWORK
1118
PACKET RELAY
1108
LINK LAYER
LINK ENCODING
SUBNET ROUTING (LRH)
LINK
LINK
LINK ENCODING
1120
FLOW CONTROL
MEDIA ACCESS CONTROL
PACKET RELAY
MAC
MAC
MAC
MAC
MEDIA ACCESS CONTROL
1110
PHYSICAL LAYER
END NODE
SWITCH
ROUTER
END NODE
1111
1122
SIGNALING
1113
1124
1115
1126

FIG. 12A

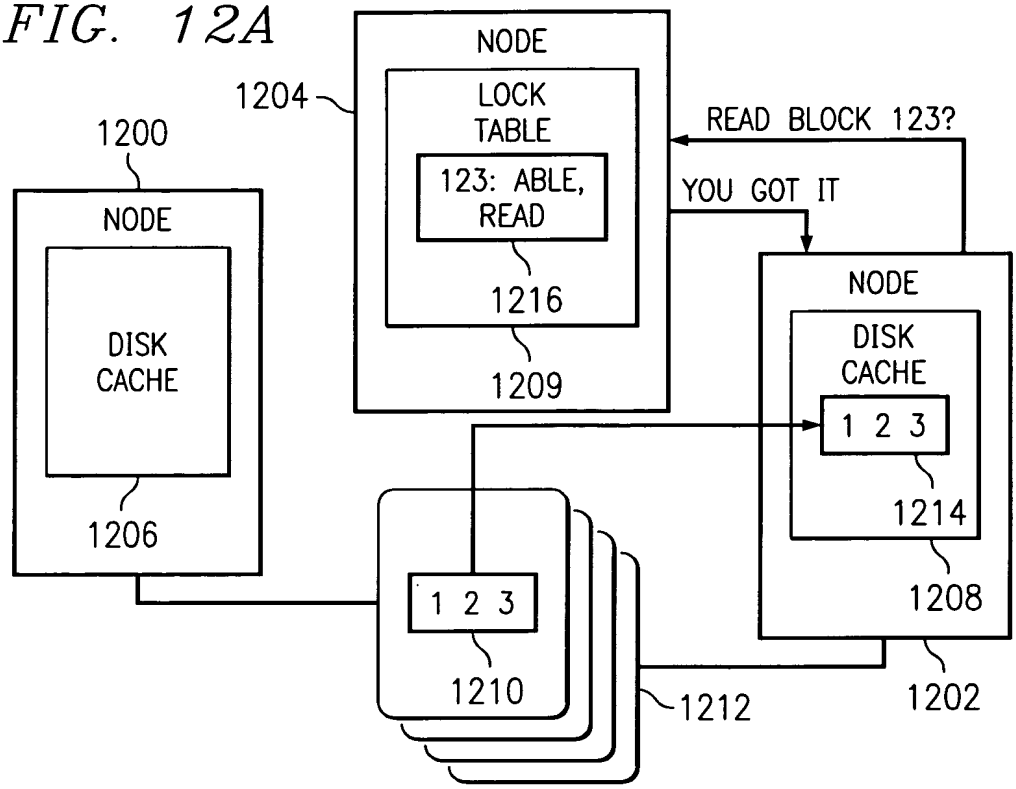
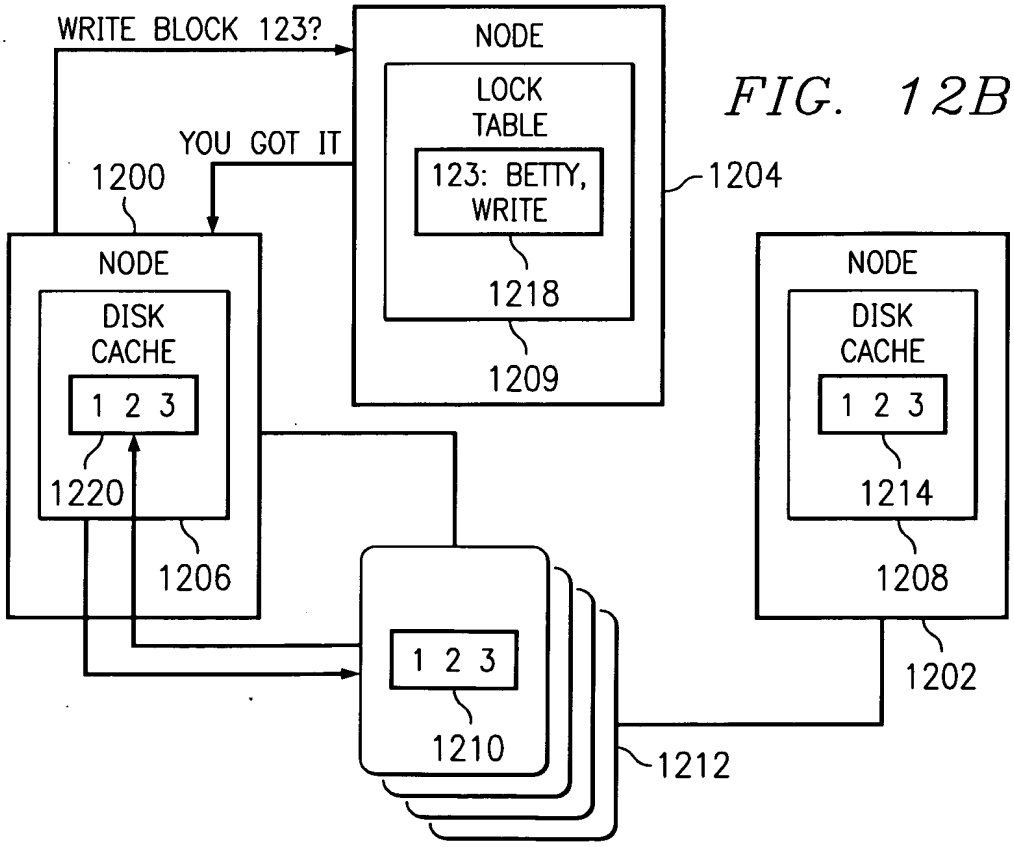


FIG. 12B



09525595 - 101501

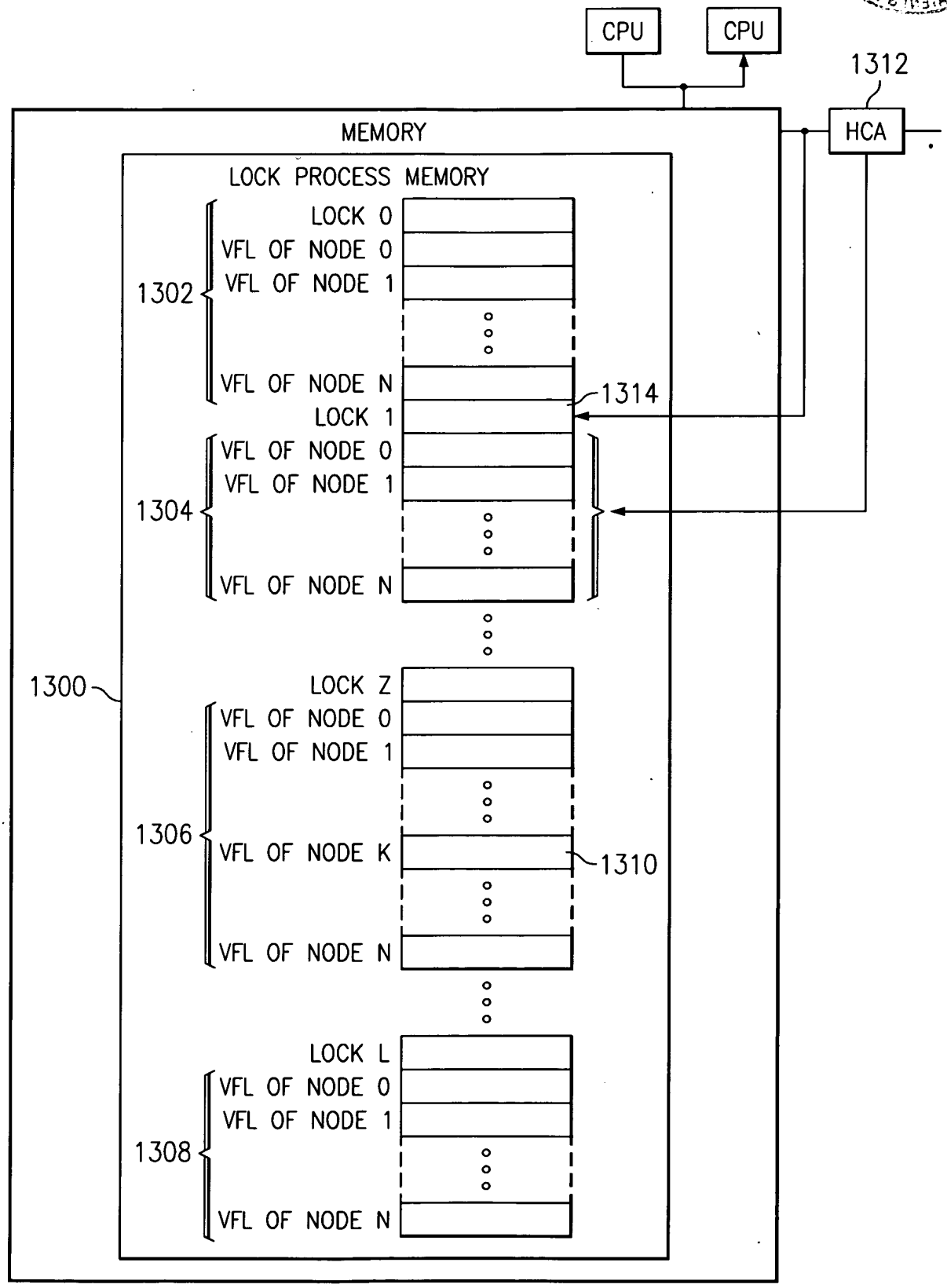


FIG. 13

FIG. 14

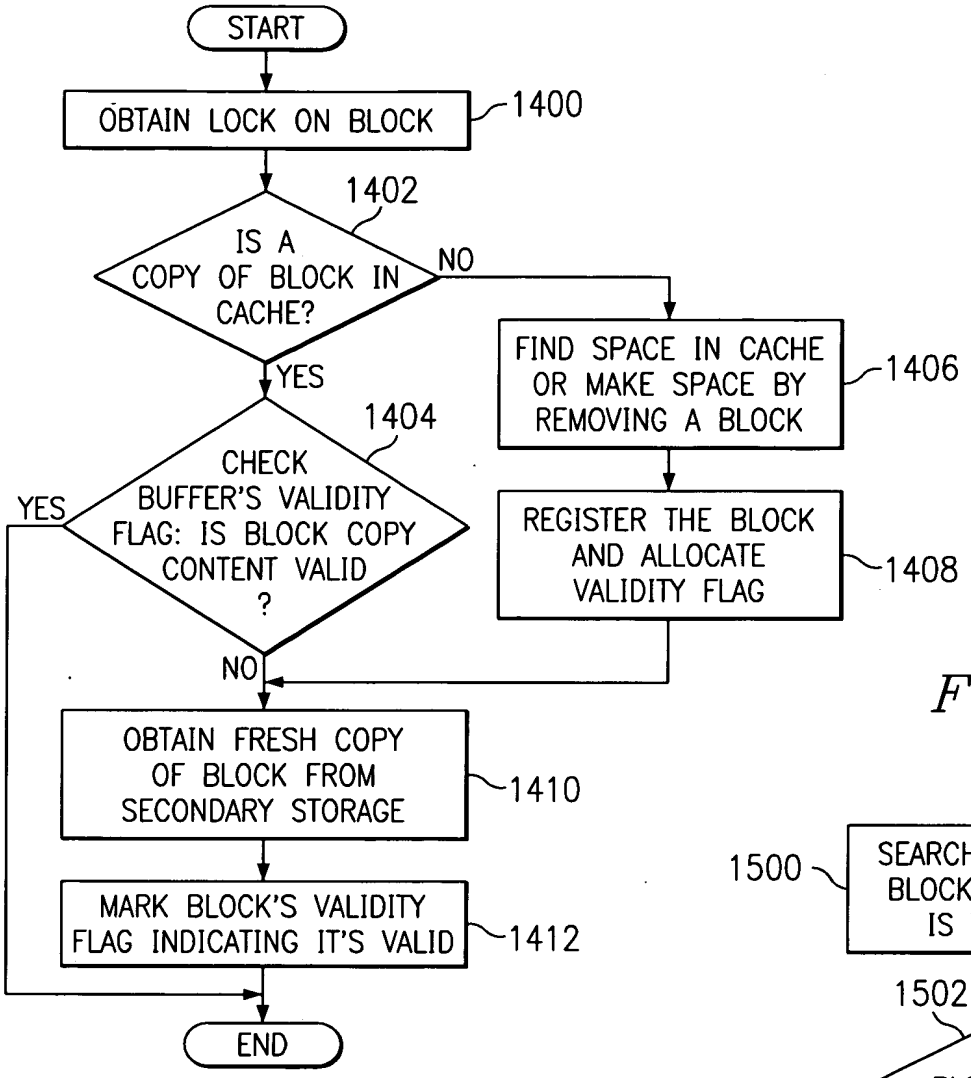
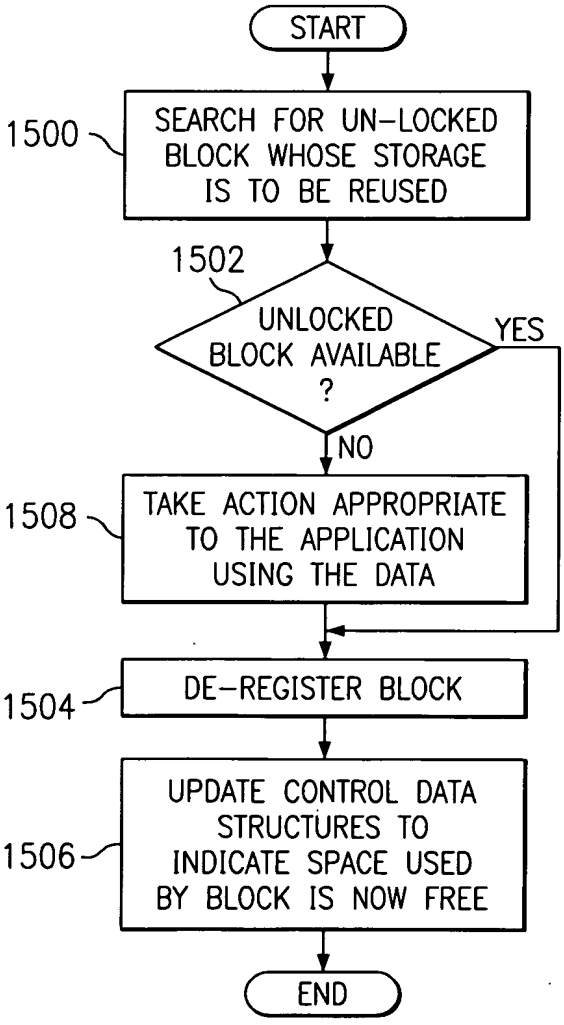

START
OBTAIN LOCK ON BLOCK
1400
1402
IS A COPY OF BLOCK IN CACHE?
NO
YES
FIND SPACE IN CACHE OR MAKE SPACE BY REMOVING A BLOCK
1406
1404
CHECK BUFFER'S VALIDITY FLAG: IS BLOCK COPY CONTENT VALID ?
YES
REGISTER THE BLOCK AND ALLOCATE VALIDITY FLAG
1408
NO
OBTAIN FRESH COPY OF BLOCK FROM SECONDARY STORAGE
1410
MARK BLOCK'S VALIDITY FLAG INDICATING IT'S VALID
1412
END

FIG. 15


START
1500
SEARCH FOR UN-LOCKED BLOCK WHOSE STORAGE IS TO BE REUSED
1502
UNLOCKED BLOCK AVAILABLE ?
YES
NO
1508
TAKE ACTION APPROPRIATE TO THE APPLICATION USING THE DATA
1504
DE-REGISTER BLOCK
1506
UPDATE CONTROL DATA STRUCTURES TO INDICATE SPACE USED BY BLOCK IS NOW FREE
END